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Organic carbon decomposition rates with depth under an agroforestry system in a calcareous soil

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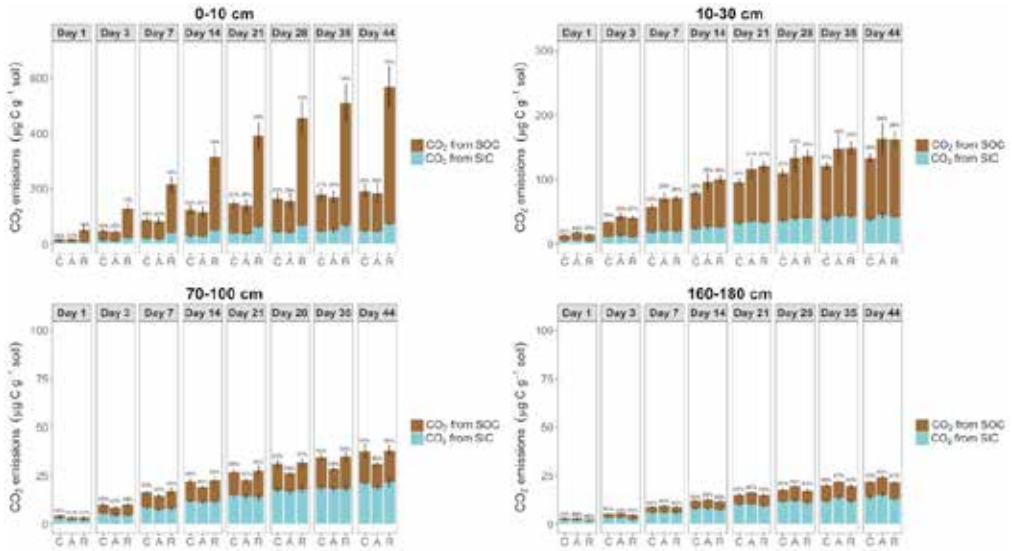
The aims of this study were: (i) assess soil organic carbon (SOC) mineralisation potential as a function of soil depth in an agroforestry (AF) plot compared to an agricultural plot (ii) estimate the contribution of soil inorganic carbon (SIC) to CO2 emissions at different depths. Soils were collected in an 18-year-old AF (tree rows and alleys) and in an adjacent agricultural plot. The incubation comprised four soil replicates per location (control, tree row, alley) and per depth (0-10, 10-30, 70-100 and 160-180 cm). Soil samples were moistened to reach field capacity, at pF 2.5, and were then incubated at 20°C in the dark. The CO2 concentration and the δ13C of the CO2 were measured after 1, 3, 7, 14, 21, 28, 35 and 44 days. The microbial biomass was measured at the end of the incubation. Decomposition rates were calculated, as well as the metabolic quotient. The cumulated total CO2, SIC-derived CO2 and SOC-derived CO2 emissions were only significantly higher in tree row than in the alley or in the control plot at 0-10 cm. SOC decomposition rates decreased with increasing depth. Contributions of SIC to total CO2 emissions according were comprised between 0.15 and 0.30 in topsoil layers and between 0.50 and 0.70 in subsoil layers. The higher emission in the tree row at 0-10 cm was related to a large amount of labile particulate organic matter. SOC did not seem to be more stabilized in AF compared to the control. SIC-derived CO2 must be taken into account on calcareous soils.



Contribution of soil organic carbon (SOC) and soil inorganic carbon (SIC) derived CO2 to cumulated CO2 emissions (µg C-CO2 g-1 soil) during the incubation. C= control plot, A= cropped alley, R: tree row. Error bars are standard errors (N=4). The percentages represent the proportion of total CO2 emissions derived from soil inorganic carbon (SIC).

Keywords: alley cropping, silvoarable system, deep SOC, potential mineralization, metabolic quotient.

References:

1. Cardinael et al., 2015 Geoderma 259-260:288-299
2. Cardinael et al., 2018 Biogeosciences 15:297-317